Amendments to the Drawings:

The attached sheet of drawings includes changes to Figures 1-3. These sheets, which includes Figures 1-7 replaces the original sheets including Figures 1-7. In Figures 1-3, previously omitted "Prior Art" has been added.

Attachment: Replacement Sheet
Annotated Sheet Showing Changes

REMARKS:

This is in response to the Office Action dated February 21, 2006. Claim 16 has been amended to broaden the claim. Reexamination and reconsideration are respectfully requested.

The Drawings:

The Office Action objects to the drawings. Applicant proposes drawing corrections indicated in red on the attached sheets and provides replacement formal drawings incorporating the changes.

The § 112 Rejection:

The Office Action rejects the pending claims as indefinite for "omitting essential steps." Applicant respectfully submits that the claims are definite and their scope is readily understood by one of ordinary skill.

Applicant further submits that the claims are complete as written and do not omit "essential steps." As discussed in the background of the application at paragraph 28, the real time FROG implementation using PCPG phase retrieval generally converges well. The application indicates at paragraph 42 that the PCPG phase retrieval technique (as an example) can stagnate or otherwise develop errors. "Consequently, it is preferable to ... provide[ ] feedback to a user to allow identification of stagnation or other types of errors." The particular feedback provided in the inventions of claims 1 and 10 is a feedback parameter.

Because the FROG technique generally converges well, it is generally unnecessary to do anything in response to or with the feedback parameter. Action is required on the feedback parameter only if the feedback parameter shows that there are problems with the retrieval. The claims apply to individual measurements or phase retrievals and so most individual measurements or phase retrievals practicing the claims need not do anything with the feedback parameter once it is obtained. Thus, it is not "essential" to the invention of claims 1 or 10 that anything be done with the feedback parameter.

There is nothing in the application that suggests that the additional steps proposed in the Office Action's § 112 rejection are "essential" to implementations of the invention of claims 1 and 10. To the contrary, it is clear from the application that, on most measurements or phase retrieval operations according to the inventions of claims 1 and 10, nothing needs to be done with the feedback parameter because the methods will converge without errors or stagnation. Thus, practice of the inventions of claims 1 and 10 may generate but not use the feedback parameter.

It appears that the Office Action views the use of the word "feedback" in the claims and application to imply a control system. That is not intended nor does the application indicate that a control system is required to implement its teachings. Rather, the various implementations described in the application make it clear that,

while a control system implementation is possible, it is by no means the only way to implement aspects of the application's teachings. Similarly, while claims 1 and 10 can be implemented to normally perform a function in response to the feedback parameter, that is by no means required.

The Office Action also rejects claim 13 and its dependent claims, despite the explicit recitation that the feedback parameter is used to perform a control operation. The application describes various control operations that might be implemented using the feedback parameter. Applicant submits that there are no missing "essential steps" in the definition of the claim 13 invention. Rather, claim 13 corresponds to a number of different control operations, various examples of which are set out in the application.

Applicant notes that some of the control operations within the scope of claim 13 are specifically called out in claim 13's dependent claims. Applicant submits that the Office Action's § 112 rejection is wholly misplaced with respect to claims 14-21.

Applicant respectfully requests reconsideration and withdrawal of the indefiniteness rejection.

The § 103 Rejections:

The Office Action rejects claims 1-5, 8-11, 13-14, 16-17, 19 and 21 over an article by Kane, et al., "Real-time Inversion of Polarization Gate Frequency-Resolved Optical Gating Spectrograms, Applied Optics, Vol. 42, No. 6, 1140-44 (Feb.

2003) taken in view of U.S. Patent No. 6,570,704 to Palese. The remaining claims are rejected over the Kane article taken in view of the Palese patent and further taken in view of one or more additional references. Applicant submits that, if the teachings of the Kane article were combined with the teachings of the Palese patent, the result of the combination would not be the methods defined by any of the pending claims.

Specifically, the Palese patent teaches using the ***output*** from a FROG retrieval to provide feedback for phase and wavelength locking of the multiple sources of a laser array. See Palese patent at col. 6, lines 4-14. FROG retrieval itself provides the feedback in the system – there is no process that provides feedback about the quality of the FROG retrieval. If the FROG retrieval has an error or stagnation, neither the Palese patent nor the Kane article would detect such an error or stagnation. The Palese patent does not teach developing feedback that characterizes the quality of the FROG retrieval.

The Palese patent does not suggest modifying the FROG retrieval processes of the Kane article. Nothing in the Palese patent could be used in improving the general FROG retrieval process. For example, the FROG retrieval processes of the Kane article would not benefit from the phase or wavelength locking suggested by the Palese patent.

To be clear, the teachings of the Kane article can and would be readily implemented in the system described by the Palese patent, but that resulting system would not generate the feedback parameter recited in each of the independent claims of the present application. The Palese patent's system generates feedback about wavelengths and phase using FROG to determine the phase and wavelengths of an optical system used to recompress optical pulses that is external to and independent of the FROG device. Neither that sort of feedback nor optical system is used in the FROG retrieval process. If the teachings of the Kane article and the Palese article were combined, the combined system would provide feedback about wavelength and phase locking and would not provide any feedback about the quality of the FROG retrieval process.

The system resulting from modifying the Palese patent in view of the Kane article would never generate a "feedback parameter providing information characterizing the real time phase retrieval" obtained by "processing the measured FROG trace" as required by claim 1 and its dependent claims. The other references do not address the deficiencies of the Office Action's proposed combination. Consequently, claim 1 and claims 2-9 distinguish over the art of record and are in condition for allowance.

Claim 10 similarly distinguishes over the cited references by reciting "generating a feedback parameter providing information characterizing the real

time phase retrieval" obtained by "processing the measured FROG trace data set." The combined teachings of the Kane article and the Palese patent would not generate a feedback parameter characterizing the real time phase retrieval obtained by FROG processing. Thus, claims 10, 11 and 12 distinguish over the art of record and are in condition for allowance.

Claim 13 distinguishes over the art of record by reciting "generating in real time a feedback parameter providing information characterizing the real time phase retrieval" obtained by "processing the measured FROG trace data set." Claim 13 and its dependent claims 14-21 distinguish over the Kane article taken in view of the Palese patent and are in condition for allowance.

Additional Comments:

Applicant wishes to correct certain erroneous comments about the Kane article in the discussion of the dependent claims. The FROG trace error has never been used on real-time FROG systems for real-time monitoring the retrieval because the PCGP algorithm does not use the FROG trace error or perform any minimization. The FROG trace error described in the Kane article was calculated on saved data obtained by a real-time FROG device.

With respect to claims 2, 3, 16 and 17, none of the referenced trace errors or display of trace errors is derived in real time in the Kane article. Figure 3 of the Kane article does not disclose a display of the measured and retrieved FROG traces.

It discloses a raw video display of the output from the FROG device, which is a display of the measured FROG trace (shown as an image and available as a 3-D plot), and it discloses a display of the retrieved pulse. The retrieved pulse is not the same as the retrieved FROG trace. The retrieved pulse is displayed on an X-Y plot while the retrieved FROG trace is calculated from the retrieved pulse and is displayed as an image or a 3-D plot. The retrieved FROG trace is a spectrogram of the retrieved pulse. Comparing the measured FROG trace with the retrieved FROG trace can be used to determine the fidelity of the FROG retrieval, which is even more effective than the real-time display of the FROG trace error.

With respect to the Office Action's comments about claim 4, claim 4 does not relate to a feedback loop. The feedback loop of the Palese patent does not relate to the Kane article's FROG phase retrieval process. Using the previous result as a starting point for a subsequent retrieval is not inherent for FROG retrievals. The FROG retrieval may work best when a pulse with random phase is used as the initial guess. Indeed, using smooth phase for a starting point can actually slow down the retrieval.

With respect to claims 6, 12 and 20, applicant disagrees with the Office Action's assumptions with respect to gamma correction. Gamma correction is common in video systems. It is not commonly used in scientific applications, however. The reason for gamma correction in some of the application's real-time

FROG inversions is not obvious. Because FROG retrievals use the square root of image data, any noise present in the FROG trace is effectively amplified, sometimes severely, which can cause problems with the FROG retrieval. Thus, turning the gamma correction on can help to suppress noise in the FROG retrievals.

Claim 14 teaches the use of a control operation to restart the phase retrieval process and does not discuss the use of a previous result as a starting point for a subsequent retrieval. Applicant consequently submits that the Office Action's analysis of claim 14 is incorrect.

Respectfully submitted,

Date: 4/7/2006

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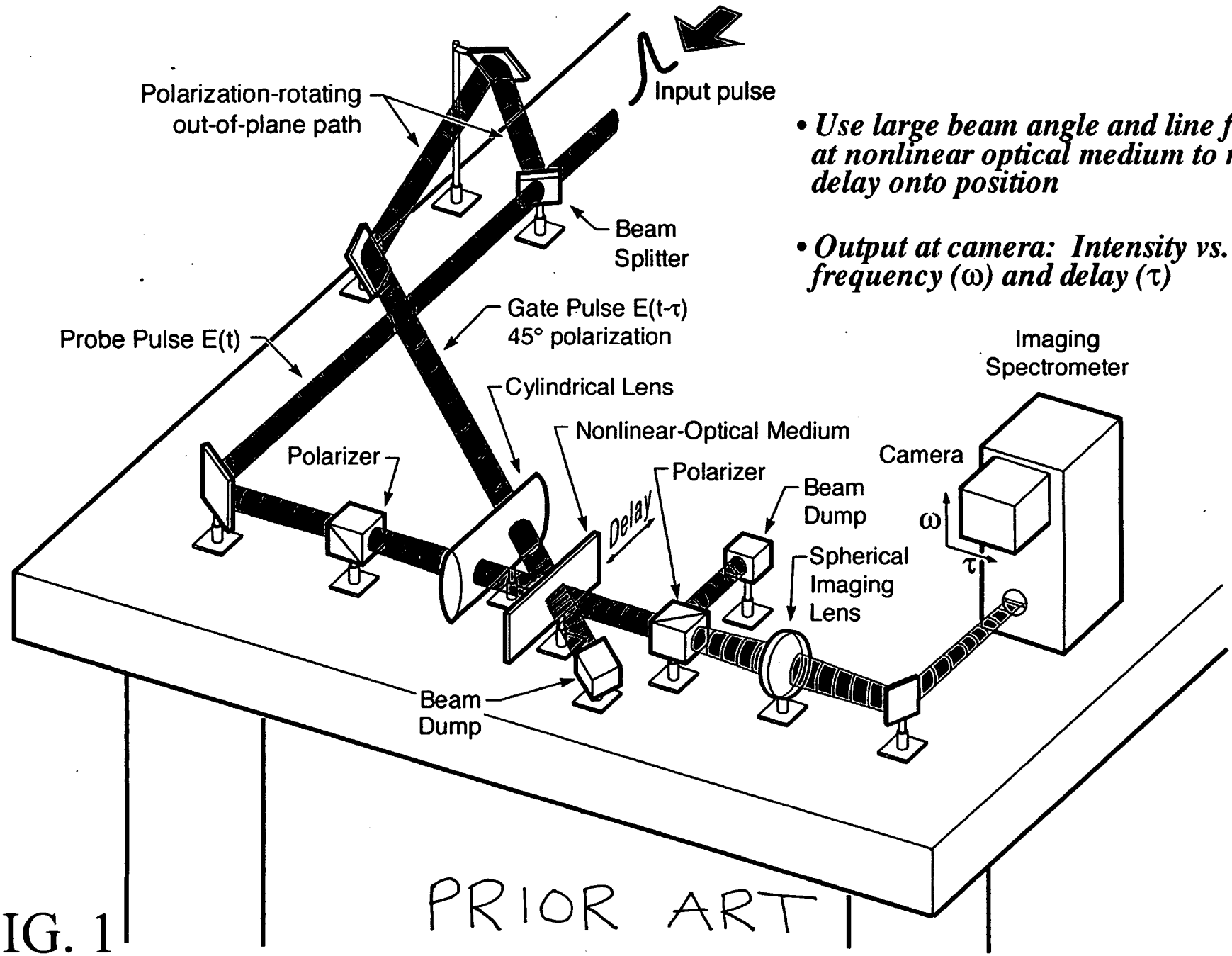
Single-shot Polarization-Gate FROG



- *Use large beam angle and line focus at nonlinear optical medium to map delay onto position*
- *Output at camera: Intensity vs. frequency (ω) and delay (τ)*

PRIOR ART

FIG. 1

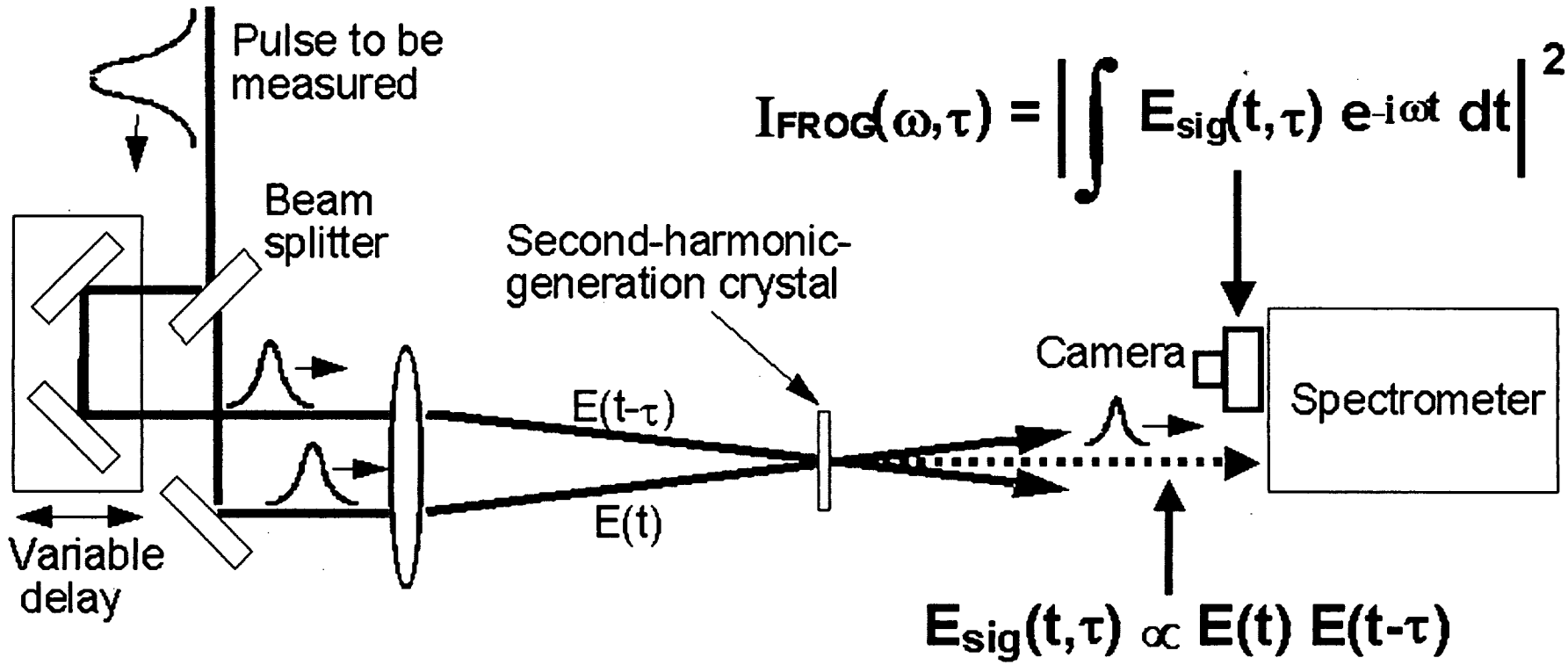


FIG. 2

PRIOR ART

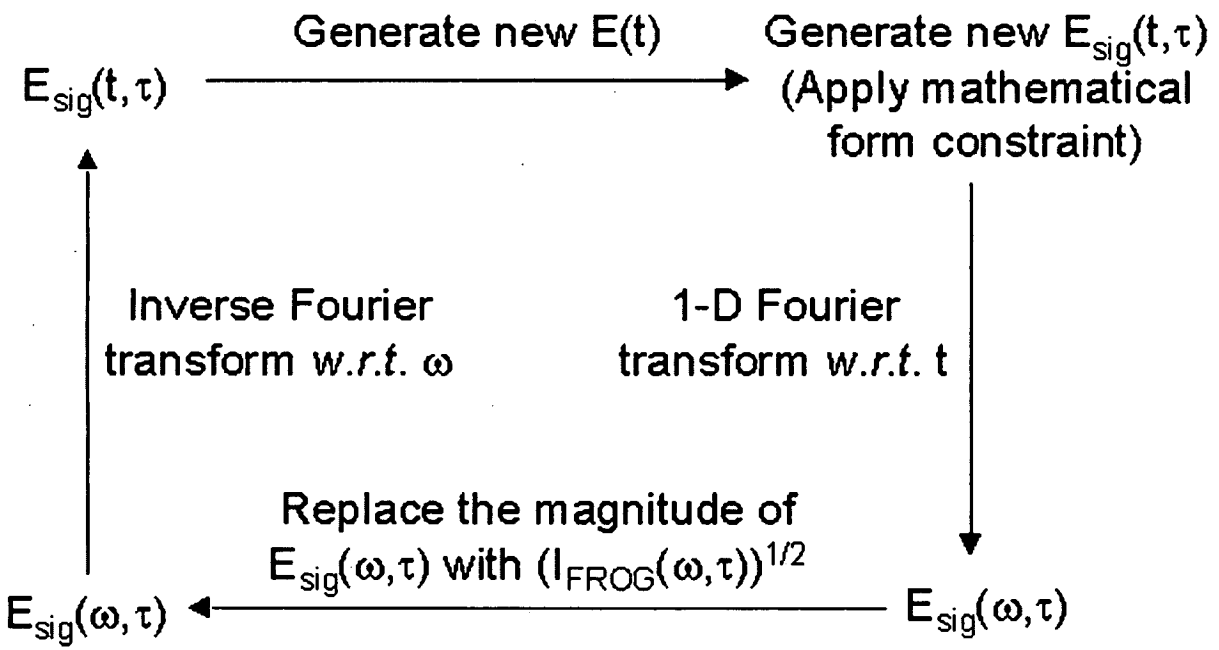


FIG. 3

PRIOR ART

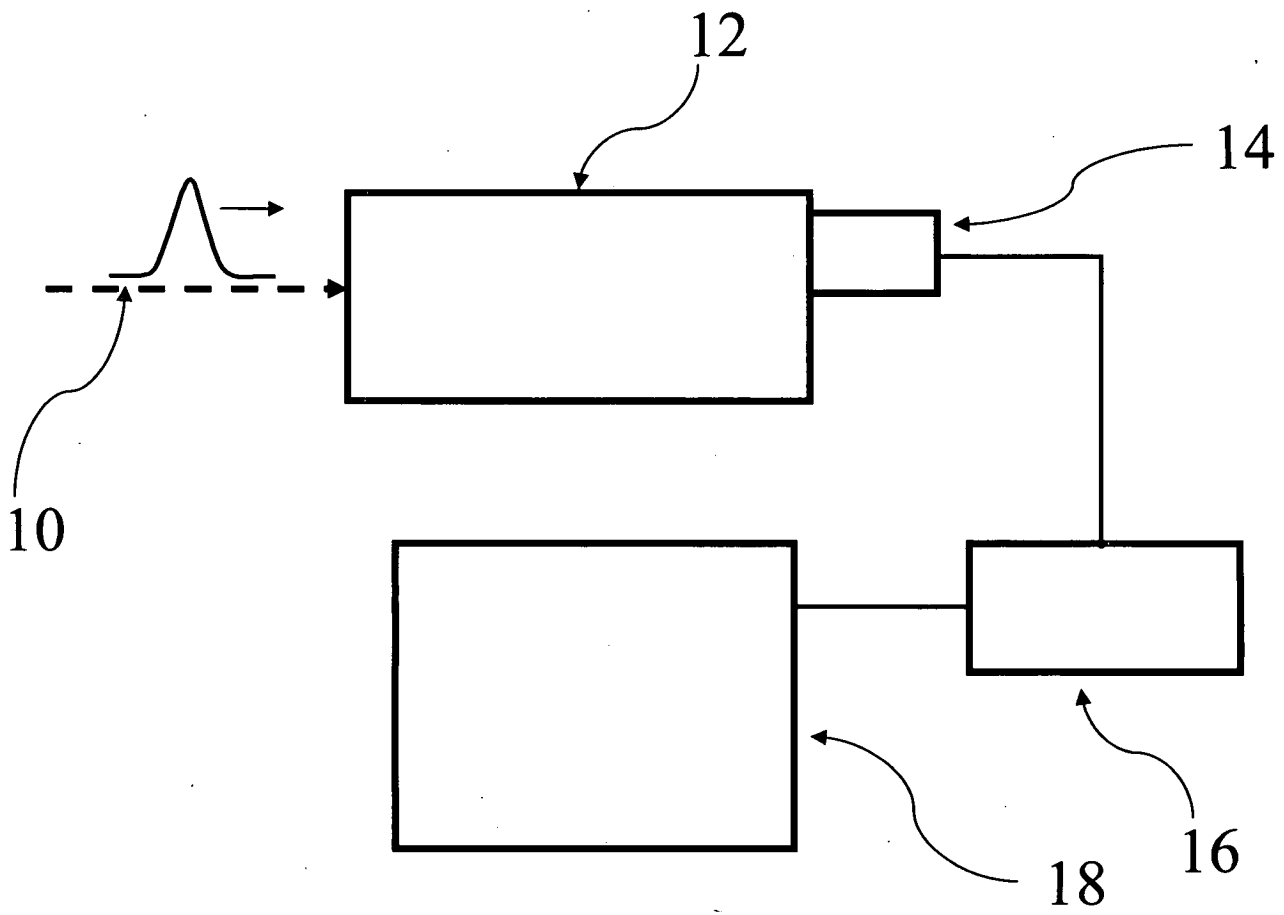


FIG. 4

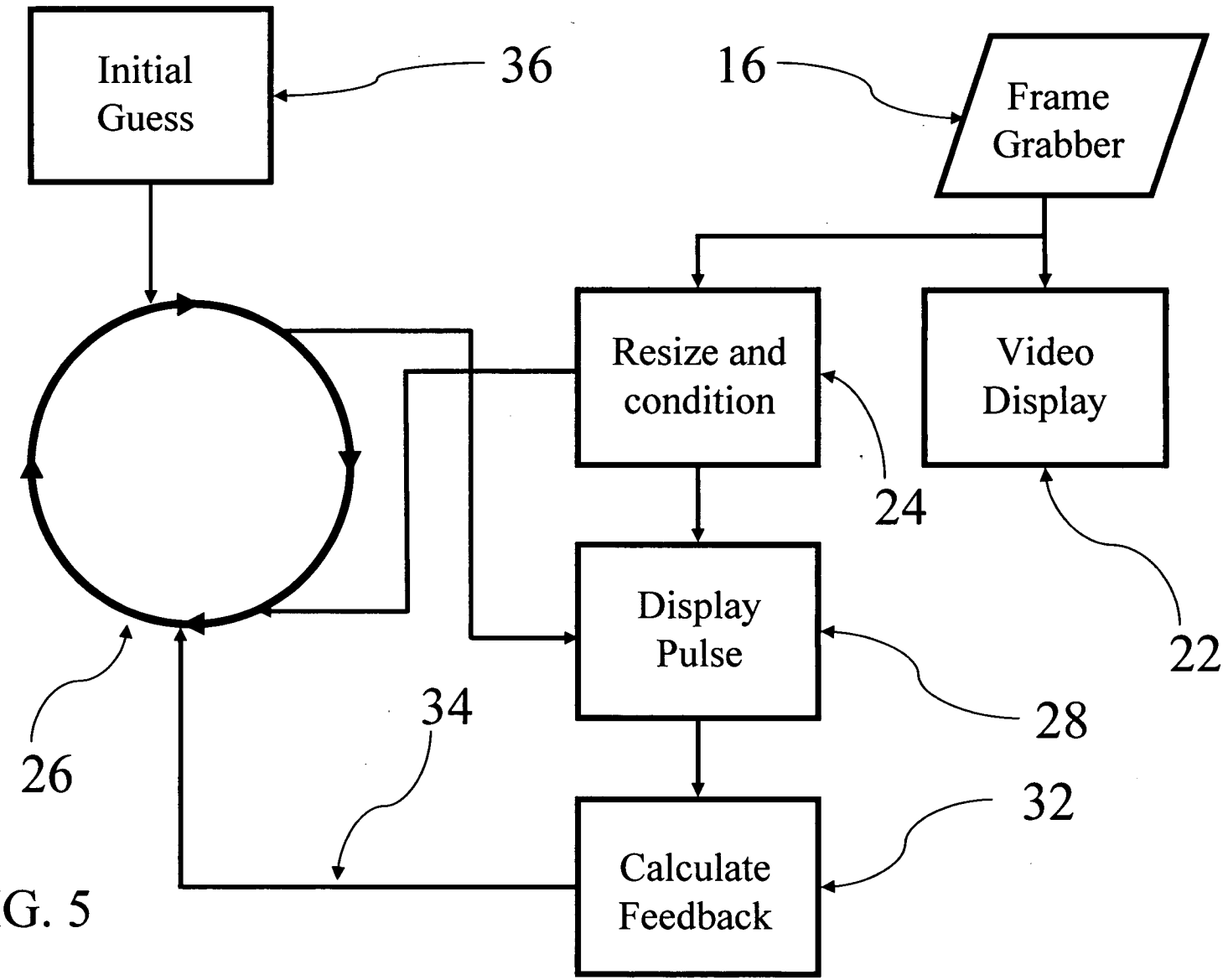

Initial Guess
36
16
Frame Grabber
Resize and condition
Video Display
24
Display Pulse
22
28
34
26
32
Calculate Feedback

FIG. 5

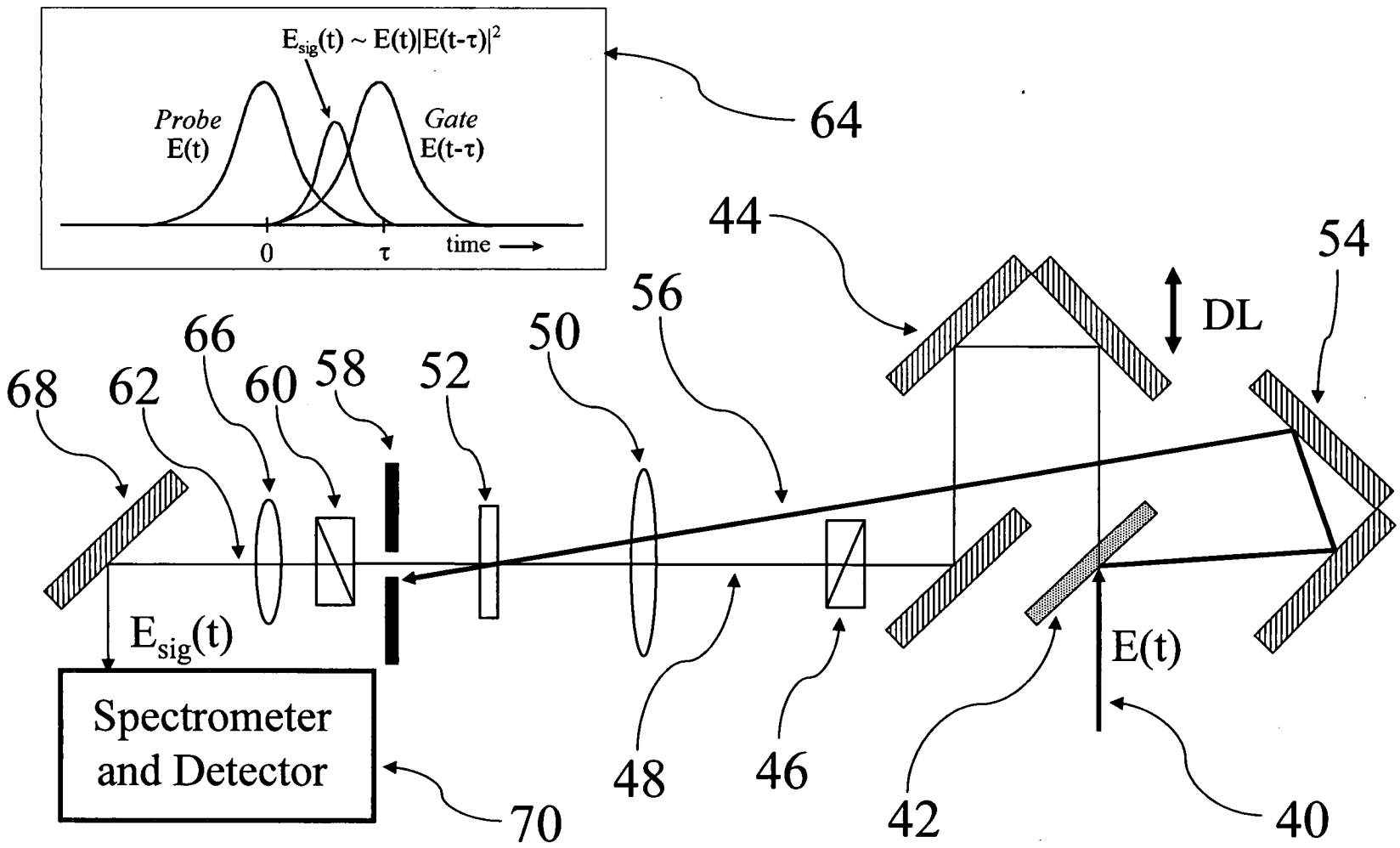

$E_{sig}(t) \sim E(t)|E(t-\tau)|^2$
Probe
E(t)
Gate
E(t-τ)
0
τ
time
64
44
54
DL
56
50
66
68
62
60
58
52
$E_{sig}(t)$
E(t)
Spectrometer
and Detector
70
48
46
42
40

FIG. 6

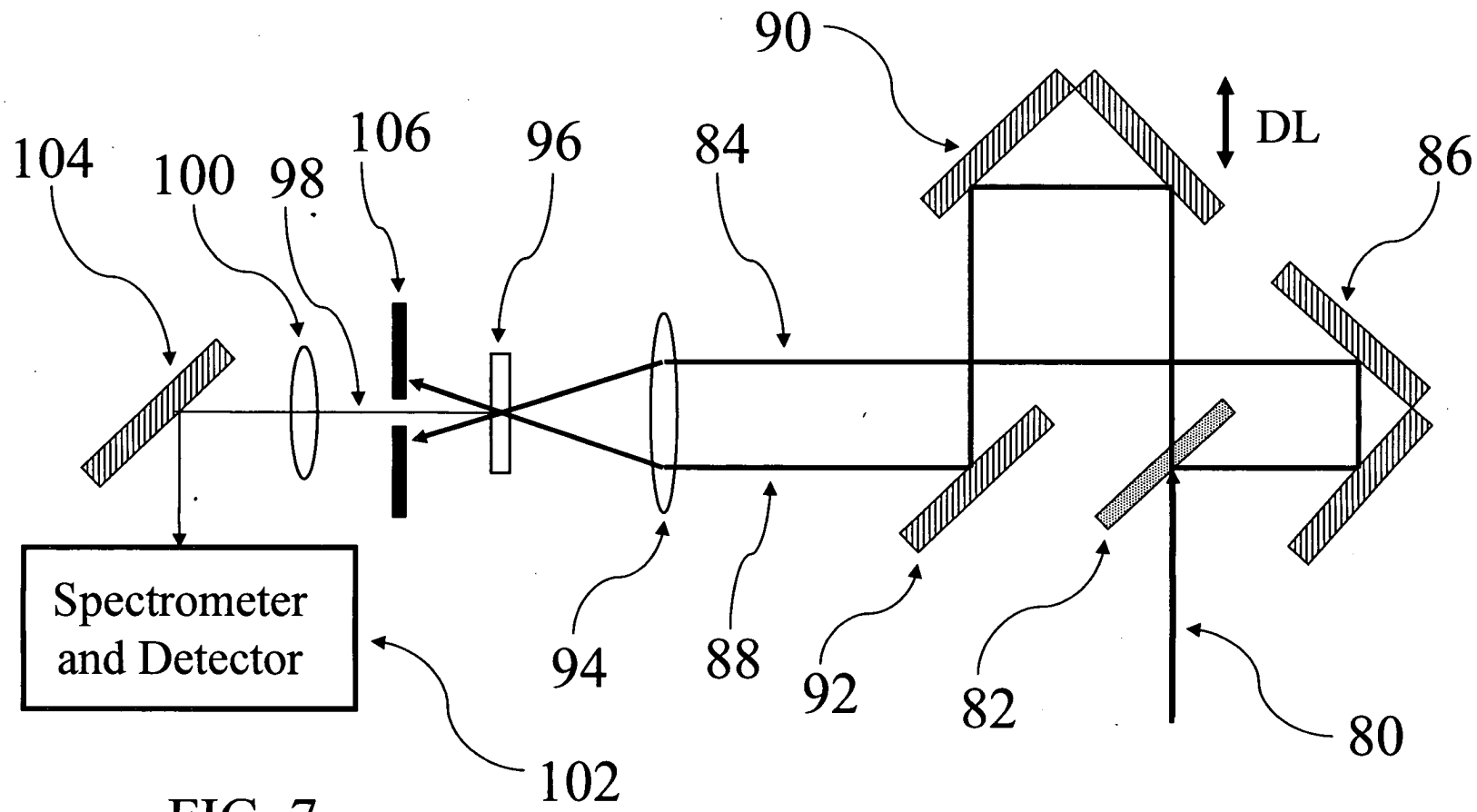

90
DL
104
100
98
106
96
84
86
Spectrometer and Detector
94
88
92
82
80
102

FIG. 7